What is claimed is:

1.   A method for operating a rate-adaptive pacemaker wherein measured exertion levels in the patient are mapped to a sensor indicated rate by a rate response curve,

5   comprising:

automatically determining the patient's maximum exercise capacity as defined by a long-term maximum exertion level by collecting maximum measured exertion levels over a specified period of time;

wherein the rate response curve is defined such that an exertion level

10   corresponding to the patient's maximum exercise capacity would be mapped to a physiologically favorable maximum rate, MAR;

limiting the rate mapped by the rate response curve to a specified maximum sensor indicated rate MSR that is independent from the MAR; and,

increasing the MSR after a specified period time during which the long-term

15   maximum exertion level is updated.

2.   The method of claim 1 wherein the MSR is gradually increased to equal the MAR.

20   3.   The method of claim 2 further comprising:

collecting daily maximum exertion levels;

periodically updating a long-term maximal exertion level of the patient to equal a maximum among the collected daily maximum exertion levels during a specified time period; and,

25   adjusting the slope of the rate response curve in order for the updated long-term maximal exertion level to be mapped to a specified maximum sensor indicated rate.

4.   The method of claim 3 wherein the collected daily maximum exertion levels are maximums among moving averages of the exertion levels measured during a day.

5. The method of claim 3 wherein the rate response curve is a dual-slope curve with a slope that changes from a low rate response factor to a high rate response factor at a heart rate breakpoint that is computed as a percentage of the patient's rate reserve.

6. The method of claim 5 wherein and the rate response curve is adjusted by increasing or decreasing the low rate response factor.

7. The method of claim 5 wherein the high rate response factor is adjusted to map the patient's long-term maximum exertion level to the maximum sensor indicated rate.

8. The method of claim 5 wherein the slope of the rate response curve is adjusted with the heart rate breakpoint maintained as a fixed percentage of the rate reserve.

9. The method of claim 5 wherein the slope of the rate response curve is adjusted with the heart rate breakpoint maintained as a dynamic percentage of the rate reserve that changes in accordance with changes in the long-term maximum exertion level.

10. The method of claim 5 wherein the percentage of the patient's rate reserve used to compute the heart rate breakpoint is increased or decreased by the percentage increase or decrease, respectively, in the long-term maximum exertion level as a result of updating.

11. The method of claim 1 further comprising:
collecting daily maximum exertion levels and daily maximum sensor indicated rates;
computing weekly averages of the daily maximum exertion levels and sensor indicated rates;
computing a sensor target rate as a function of the weekly average daily maximum exertion level and the patient's maximum exercise capacity as defined by a long-term maximum exertion level; and,

periodically adjusting the slope of the rate response curve in accordance with the difference between the weekly average maximum sensor indicated rate and the sensor target rate.

5   12.   The method of claim 11 wherein the sensor target rate is computed as a mapping from a maximum exertion level to a percentage of the patient's maximum allowable heart rate.

13.   The method of claim 12 wherein a maximum exertion level is mapped to a
10   percentage of the patient's maximum allowable heart rate in accordance with discrete thresholds relative to the patient's maximum exercise capacity in order to compute a sensor target rate.

14.   The method of claim 11 wherein the slope of the rate response curve is adjusted
15   by a specified step amount so as to increase or decrease the responsiveness of the pacemaker in accordance with whether the weekly average maximum sensor indicated rate is lesser or greater, respectively, than the sensor target rate.

15.   A system for operating a rate-adaptive pacemaker wherein measured exertion
20   levels in the patient are mapped to a sensor indicated rate by a rate response curve, comprising:

means for automatically determining the patient's maximum exercise capacity as defined by a long-term maximum exertion level by collecting maximum measured exertion levels over a specified period of time, wherein the rate response curve is defined
25   such that an exertion level corresponding to the patient's maximum exercise capacity would be mapped to a physiologically favorable maximum rate, MAR;

means for limiting the rate mapped by the rate response curve to a specified maximum sensor indicated rate MSR that is independent from the MAR; and,

means for increasing the MSR after a specified period time during which the long-
30   term maximum exertion level is updated.

16.   The system of claim 15 wherein the MSR is gradually increased to equal the MAR.

17.   The system of claim 15 further comprising:

means for collecting daily maximum exertion levels;

means for periodically updating a long-term maximal exertion level of the patient to equal a maximum among the collected daily maximum exertion levels during a specified time period; and,

means for adjusting the slope of the rate response curve in order for the updated long-term maximal exertion level to be mapped to a specified maximum sensor indicated rate.

18.   The system of claim 17 wherein the collected daily maximum exertion levels are maximums among moving averages of the exertion levels measured during a day.

19.   The system of claim 17 wherein the rate response curve is a dual-slope curve with a slope that changes from a low rate response factor to a high rate response factor at a heart rate breakpoint that is computed as a percentage of the patient's rate reserve.

20.   The system of claim 19 wherein and the rate response curve is adjusted by increasing or decreasing the low rate response factor.

21.   The system of claim 19 wherein the high rate response factor is adjusted to map the patient's long-term maximum exertion level to the maximum sensor indicated rate.

22.   The system of claim 19 wherein the slope of the rate response curve is adjusted with the heart rate breakpoint maintained as a fixed percentage of the rate reserve.

23.   The system of claim 19 wherein the slope of the rate response curve is adjusted with the heart rate breakpoint maintained as a dynamic percentage of the rate reserve that changes in accordance with changes in the long-term maximum exertion level.

20

24. The system of claim 19 wherein the percentage of the patient's rate reserve used to compute the heart rate breakpoint is increased or decreased by the percentage increase or decrease, respectively, in the long-term maximum exertion level as a result of updating.

25. A processor-readable storage medium having processor-executable instructions for performing the method recited in claim 1.